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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 12789.2-2025

Replacing GB/T 12789.2-1991

**Criteria for nuclear reactor instrumentation - Part 2: Pressurized
water reactors**

核反应堆仪表准则 第2部分：压水堆

(English Translation)

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Foreword

This document is in accordance with the provisions of GB/T 1.1-2020 "Guidelines for standardization work Part 1: Structure and drafting rules for standardization documents" Drafting.

This document is Part 2 of GB/T 12789 "Criteria for Nuclear Reactor Instrumentation". GB/T 12789 has been published in the following parts.

- Part 1: General principles;
- Part 2: Pressurized water reactor;
- Part 3: High temperature gas-cooled reactor;
- Part 4: Liquid metal cooled fast reactor.

This document replaces GB/T 12789.2-1991 "Criteria for Instrumentation in Nuclear Reactors Part 2: Pressurized Water Reactors" and is compatible with GB/T 12789.2-Compared with 1991, in addition to structural adjustments and editorial changes, the main technical changes are as follows.

- Changed the description of the scope (see Chapter 1, Chapter 1 of the 1991 edition);
- Added "Terms and Definitions" (see Chapter 3);
- Changed the description of the reactor coolant circuit (see 4.2, 3.4 of the 1991 edition);
- Added fission product monitoring instrumentation requirements (see 4.6);
- Added parameter requirements for indicating the rate of change of neutron injection rate and correction requirements for the rate of change of neutron injection rate (see 5.1.2);
- Added design requirements for power distribution monitoring using continuous measurement devices (see 5.1.3);
- Added relevant requirements for passive starting (see 5.1.5);
- Added the calibration and calibration methods of neutron fluence rate measuring instruments (see 5.3.3);
- Added coolant flow measurement method (see 7.2.2);
- Changed the description of the requirements for dedicated safety facilities (see 8.3, 7.2 of the 1991 edition);

--- Added the description of the dedicated safety facility actions of "starting main feedwater isolation" and "main steam isolation" (see 8.3.6 and 8.3.7).

Introduction

GB/T 12789 "Guidelines for Nuclear Reactor Instrumentation" is intended to consist of four parts.

--- Part 1: General principles. The purpose is to specify the principles necessary for the safe operation of pressurized water reactors, high temperature gas-cooled reactors, and liquid metal-cooled fast reactors.

Required special instruments and general principles for their application.

--- Part 2: Pressurized water reactor. The purpose is to supplement Part 1 and specify the general requirements for pressurized water reactor type instrumentation and its application. in principle.

--- Part 3: High temperature gas-cooled reactor. The purpose is to supplement Part 1 and specify the instrumentation and General principles for its application.

--- Part 4: Liquid metal cooled fast reactor. The purpose is to supplement Part 1 and specify the fast reactor instrumentation and its application.

General principles.

Nuclear Reactor Instrumentation Guidelines Part 2: Pressurized water reactors

1 Scope

This document specifies the general requirements for the special instruments and their application necessary for the safe operation of pressurized water reactors, including general requirements, neutron injection Requirements for frequency measurement, temperature measurement, coolant measurement, protection systems, instrument power sources, control facilities, alarm devices, etc.

This document applies to the design and implementation of instrumentation directly related to reactor safety and control in pressurized water reactor types.

2 Normative references

The contents of the following documents constitute essential clauses of this document through normative references in this document.

For referenced documents without a date, only the version corresponding to that date applies to this document; for referenced documents without a date, the latest version (including all amendments) applies to this document.

GB/T 4960.2 Nuclear Science and Technology Terminology Part 2: Fission Reactor GB/T 4960.6 Nuclear Science and Technology Terminology Part 6: Nuclear Instrumentation GB/T 12789.1-2025 Nuclear reactor instrumentation standards Part 1: General principles GB/T 13284 Nuclear power plant safety system design criteria

3 Terms and definitions

The terms and definitions defined in GB/T 4960.2 and GB/T 4960.6 apply to this document.

4 General requirements

4.1

Pressurized water reactor nuclear reactor instruments shall meet the general requirements of GB/T 12789.1-2025.

4.2

Fuel cladding temperature is an important reactor parameter, but it is not measured directly. Instead, it is measured by measuring the temperature of the reactor coolant system.

The data are inferred from the temperature, pressure and flow rate as well as the reactor power and spatial distribution.

The feedback is demonstrated based on nuclear measurements, thermal measurements, control rod positions, and measurements related to power level and other parameters that reflect the reactor status.

The spatial distribution of stack power and power density should be within the allowable range.

Measurements indicating a significant imbalance between reactor power and required power can be used to provide protection functions. These measurements include the volume change of the reactor coolant system is obtained based on the pressurizer liquid level measurement. In addition, the imbalance between the reactor power and the required power Conditions can also be measured and used as protection functions. These conditions include turbine shutdown and loss of heat sink (low water level in steam generator or low feedwater flow rate).

Rely on safety valve action or reactor power reduction to prevent overpressure of the reactor coolant pressure boundary.

Rupture of the reactor coolant pressure boundary that exceeds the water replenishment system capacity will cause the reactor coolant system pressure to decrease and the pressurizer water level to increase.

The containment barrier is used to withstand the pressure, temperature and other impacts caused by the rupture of the reactor coolant circuit.